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REMARKS

Claims 2-7 and 9-20 are all the claims presently pending in the application. Claims 1 and 8 have been canceled. Claims 2-7 and 9-10 have been amended. Claims 11-20 have been added.

It is noted that the amendments are made only to more particularly define the invention and not for distinguishing the invention over the prior art, for narrowing the scope of the claims, or for any reason related to a statutory requirement for patentability. It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 4 and 10 stand rejected under 35 U.S.C. § 112, second paragraph as being allegedly indefinite. Applicant notes that claim 4 has been amended to address the Examiner's concerns. Therefore, Applicant notes that claim 4 is not indefinite and the Examiner is respectfully requested to withdraw this rejection.

Claims 1, 3, 5 and 9 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Kuriyama (JP 3-57168).

Claims 1-5 and 7-10 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by WO 01/86748 (hereinafter "Nakagawa").

Claims 2, 4, 8 and 10 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Kuriyama in view of Cipriano (U. S. Patent 4,877,695).

Claim 6 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Kuriyama in view of Basu (U. S. Patent 4,304,825).

Claim 7 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Kuriyama in view of Arai (JP 2001345118).

Claims 1-5 and 7-10 stand rejected on the ground of obviousness-type double patenting over claims 1-7 of Nakagawa et al. (U. S. Patent No. 7,029,793).

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

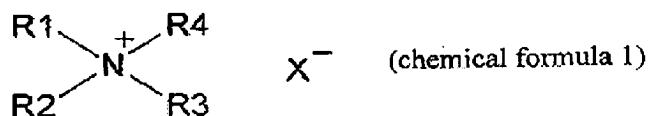
An exemplary aspect of the claimed invention (e.g., as recited in claim 1) is directed to a nonaqueous electrolyte including an organic solvent and a lithium salt dissolved in the organic

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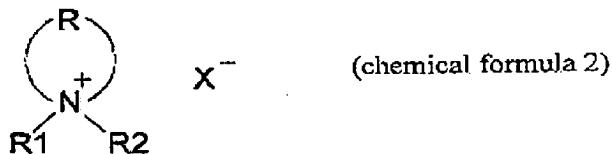
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solvent.

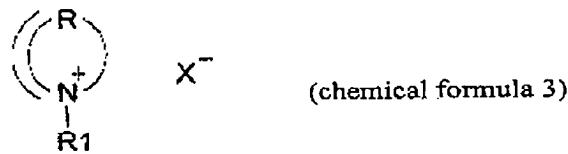
Importantly, the nonaqueous electrolyte also includes a quaternary ammonium salt in an amount of 0.06 mol/L or greater and 0.5 mol/L or less, the quaternary ammonium salt having a structure represented by any of (chemical formula 1), (chemical formula 2), and (chemical formula 3):



(wherein R1, R2, R3, and R4 each are either an alkyl group having 1-6 carbon atoms or an alkyl group in which at least part of the hydrogen atoms each has been replaced by a fluorine atom; and X⁻ is a fluorine-containing anion, and wherein R1=R2=R3=R4 is excluded) (e.g., see Application at Example 2, page 37, lines 14-21),



(wherein R is a divalent organic linking group having a main chain which has 4-5 atoms and is constituted of at least one member selected from carbon, oxygen, nitrogen, sulfur, and phosphorus; R1 and R2 each are either an alkyl group having 1-6 carbon atoms or an alkyl group in which at least part of the hydrogen atoms each has been replaced by a fluorine atom; and X⁻ is a fluorine-containing anion),



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(wherein R is an organic linking group or an organic linking group forming an aromatic ring, the organic linking groups each having a main chain which has 4-5 atoms and is constituted of at least one member selected from carbon, oxygen, nitrogen, sulfur, and phosphorus and having one single-bond end and one double-bond end; R1 is an alkyl group having 1-6 carbon atoms or an alkyl group in which at least part of the hydrogen atoms each has been replaced by a fluorine atom; and X⁻ is a fluorine-containing anion) (Application at page 8, line 10 to page 9, line 18).

These features may help to improve a charge/discharge efficiency in a battery including the nonaqueous electrolyte (Application at page 10, lines 1-11).

II. THE ALLEGED PRIOR ART REFERENCES

A. Kuriyama

The Examiner alleges that Kuriyama teaches the invention of claims 1, 3, 5 and 9. Applicant submits, however, that there are features of the claimed invention that are not taught or suggested by Kuriyama.

In particular, nowhere does Kuriyama teach or suggest "a quaternary ammonium salt in an amount of 0.06 mol/L or greater and 0.5 mol/L or less, the quaternary ammonium salt having a structure represented by any of (chemical formula 1), (chemical formula 2), and (chemical formula 3)", or "wherein R1=R2=R3=R4 is excluded", as recited, for example, in claim 2 (Application at page 8, line 10 to page 9, line 18; Example 2, page 37, lines 14-21). As noted above, these features may help to improve a charge/discharge efficiency in a battery including the nonaqueous electrolyte (Application at page 10, lines 1-11).

Clearly, these novel features are not taught or suggested by Kuriyama.

Indeed, the cited Kuriyama reference describes a lithium secondary battery using liquid electrolyte obtained by adding a quaternary ammonium salt, and the working example thereof describes tetraethyl ammonium fluoroborate (C₂H₅)₄NBF₄. This compound may correspond to the compound represented by the (chemical formula 1) as described in the specification of the present application, wherein all of R1 to R4 are the same as one another. However, because Kuriyama does not teach or suggest any other specific compound and it is silent about any compound other than the compound represented by the (chemical formula 1), wherein all of R1 to R4 are the same

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as one another, it is clear that the amended claim 2 is not the same as in the cited Kuriyama reference.

In particular, the quaternary ammonium salt as used in Example 1 of the present application is the same as the compound as used in the working example as described in the cited Kuriyama reference, that is, the compound being represented by the (chemical formula 1), wherein all of R1 to R4 are the same as one another. On the other hand, the quaternary ammonium salt as used in Example 2 of the present application is the compound represented by the (chemical formula 1), wherein all of R1 to R4 are not the same as one another. Accordingly, because all of R1 to R4 of the quaternary ammonium salt represented by the (chemical formula 1) are not the same as one another, an effect of decreasing the melting point of the quaternary ammonium salt is taken and as the case may be, the quaternary ammonium salt may become in liquid form at ordinary temperatures.

The liquid electrolyte obtained by adding the quaternary ammonium salt wherein all of R1 to R4 of the quaternary ammonium salt represented by the (chemical formula 1) are not the same as one another has decreased viscosity and the battery obtained by using the liquid electrolyte has improved charge/discharge efficiency. As a result, as shown in Table 1, the battery performance of the invention battery 2 according to Example 2 is superior to the battery performance according to Example 1. Accordingly, because the restriction is based on the description of Example 2, it is believed that the restriction is fallen within the scope of the description of the present application.

Therefore, Kuriyama simply discloses a lithium secondary battery in which an electrolyte is prepared by adding a quaternary ammonium salt into an organic solvent in which a lithium salt is dissolved. That is, nowhere does Kuriyama teach or suggest a quaternary ammonium salt having a structure represented by any of (chemical formula 1), (chemical formula 2), and (chemical formula 3).

Moreover, the Examiner expressly concedes that Kuriyama does not teach or suggest this feature on page 4 of the Office Action.

Therefore, Applicant submits that there are features of the claimed invention that are not taught or suggested by Kuriyama. Therefore, Applicant respectfully requests that the Examiner withdraw this rejection.

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B. Nakagawa

The Examiner alleges that Nakagawa teaches the invention of claims 1-5 and 7-10. Applicant submits, however, that there are features of the claimed invention that are not taught or suggested by Nakagawa.

In particular, nowhere does Nakagawa teach or suggest "*a quaternary ammonium salt in an amount of 0.06 mol/L or greater and 0.5 mol/L or less, the quaternary ammonium salt having a structure represented by any of (chemical formula 1), (chemical formula 2), and (chemical formula 3)*", or "*wherein R1=R2=R3=R4 is excluded*", as recited, for example, in claim 2 (Application at page 8, line 10 to page 9, line 18; Example 2, page 37, lines 14-21). As noted above, these features may help to improve a charge/discharge efficiency in a battery including the nonaqueous electrolyte (Application at page 10, lines 1-11).

Clearly, this novel feature is not taught or suggested by Nakagawa.

Indeed, the Examiner attempts to rely on col. 2, line 64-col. 8, line 39 and embodiments 1-10 in Nakagawa to support his position. This is clearly unreasonable.

In fact, the cited Nakagawa reference describes the quaternary ammonium salts represented by the (chemical formula 1), (chemical formula 2) or (chemical formula 3) as described in the specification of the present application, and it describes that organic solvents such as ethylene carbonate, propylene carbonate and diethyl carbonate may be added. However, in order to obtain the effect as described in the cited reference, because there is such a description that it is not preferred that an addition amount of organic solvents is too large (in column 4, lines 36 to 54), it is clear that the cited reference is a patent that nonaqueous electrolyte relates to a system a considerable amount of which is occupied by the quaternary ammonium salts.

On the other hand, as is clear from the recitation of the amended claim 2 of the present application, the claimed invention of the present application relates to an invention of nonaqueous electrolyte obtained by adding quaternary ammonium salt in of "0.06 mol/L or larger and 0.5 mol/L or smaller" (e.g., a small amount of the salt) in organic solvent (e.g., a large amount of organic solvent). Accordingly, the present application is quite different in their technical field from the cited Nakagawa reference.

Further, the cited Nakagawa reference is silent about the effects as described in the present application, that is, such effects that tiny amounts of quaternary ammonium salt among compounds constituting the nonaqueous electrolyte dramatically improves initial efficiency and high-rate

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discharge capacity which are effects of the invention of the present application. Accordingly, the claimed invention is clearly not the same as the cited Nakagawa reference.

Therefore, Applicant submits that there are features of the claimed invention that are not taught or suggested by Nakagawa. Therefore, Applicant respectfully requests that the Examiner withdraw this rejection.

C. Cipriano, Basu and Arai

The Examiner alleges that Kuriyama would have been combined with Cipriano to form the invention of claims **2, 4, 8 and 10**, with Basu to form the invention of claim 6, and with Arai to form the invention of claim 7. Applicant submits, however, that these alleged references would not have been combined and even if combined, the combination would not teach or suggest each and every feature of the claimed invention.

In particular, Applicant respectfully submits that these alleged references are unrelated. Indeed, no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

In fact, Applicant submits that the references provide no motivation or suggestion to urge the combination as alleged by the Examiner. Indeed, these references clearly do not teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, neither Kuriyama, nor Cipriano, nor Basu, nor Arai, nor any alleged combination thereof, teach or suggest "*a quaternary ammonium salt in an amount of 0.06 mol/L or greater and 0.5 mol/L or less, the quaternary ammonium salt having a structure represented by any of (chemical formula 1), (chemical formula 2), and (chemical formula 3)*", or "*wherein R1=R2=R3=R4 is excluded*", as recited, for example, in claim 2 (Application at page 8, line 10 to page 9, line 18; Example 2, page 37, lines 14-21). As noted above, these features may help to improve a charge/discharge efficiency in a battery including the nonaqueous electrolyte (Application at page 10, lines 1-11).

Clearly, this novel feature is not taught or suggested by Cipriano, Basu or Arai.

Indeed, the cited Cipriano reference describes, as an electrolyte salt, tetra alkyl ammonium tetrafluoroborate. Specific examples thereof and examples used in working examples include

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tetraethylammonium tetrafluoroborate ($(C_2H_5)_4NBF_4$ in the case of represented by chemical formula) and tetrabutylammonium tetrafluoroborate ($(C_4H_9)_4NBF_4$ in the case of represented by chemical formula) (in column 4, lines 13 to 18 and TABLE II). However, these compounds are listed in parallel with the other alkali metal salts (for example, lithium tetrafluoroborate).

Additionally, similar to the invention as described in the cited Kuriyama reference, these compounds in Cipriano correspond to compounds wherein all of R1 to R4 of the chemical formula 1 in the specification of the present application are the same as one another. In fact, Cipriano is silent about the specific example of the compound wherein all of R1 to R4 of the chemical formula 1 are not the same as one another, as recited, for example, in claim 2.

Further, like Cipriano, nowhere does Basu or Arai teach or suggest an advantage by using the quaternary ammonium salt wherein all of R1 to R4 of the chemical formula 1 are not the same as one another.

Therefore, like Cipriano, nowhere does Basu or Arai teach or suggest "*wherein R1=R2=R3=R4 is excluded*", as in the claimed invention.

Therefore, neither Cipriano, nor Basu, nor Arai make up for the deficiencies of Kuriyama.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every feature of the claimed invention. Therefore, Applicant respectfully requests that the Examiner withdraw this rejection.

III. THE OBVIOUSNESS-TYPE DOUBLE-PATENTING REJECTION

The Examiner alleges that claims 1-7 of Nakagawa make obvious the invention of claims 1-5 and 7-10. Applicant submits, however, that that there are features of the claimed invention that are not taught or suggested by Nakagawa.

In particular, nowhere do claims 1-7 of Nakagawa teach or suggest "*a quaternary ammonium salt in an amount of 0.06 mol/L or greater and 0.5 mol/L or less, the quaternary ammonium salt having a structure represented by any of (chemical formula 1), (chemical formula 2), and (chemical formula 3)*", or "*wherein R1=R2=R3=R4 is excluded*", as recited, for example, in claim 2 (Application at page 8, line 10 to page 9, line 18; Example 2, page 37, lines 14-21). As noted above, these features may help to improve a charge/discharge efficiency in a battery including the nonaqueous electrolyte (Application at page 10, lines 1-11).

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In fact, as noted above, Nakagawa discloses a system in which a considerable amount of the nonaqueous electrolyte is occupied by the quaternary ammonium salts. That is, nowhere do claims 1-7 of Nakagawa teach or suggest a nonaqueous electrolyte obtained by adding quaternary ammonium salt in of "0.06 mol/L or larger and 0.5 mol/L or smaller" in organic solvent, as in the claimed invention.

Therefore, Applicant submits that there are features of the claimed invention that are not taught or suggested by claims 1-7 of Nakagawa. Therefore, Applicant respectfully requests that the Examiner withdraw this rejection.

IV. FORMAL MATTERS AND CONCLUSION

Applicant notes that the specification has been amended to address the Examiner's objection thereto on page 2 of the Office Action.

In view of the foregoing, Applicant submits that claims 2-7 and 9-20, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

To the extent necessary for submitting this response, Applicant hereby petitions for an extension of time under 35 C.F.R. 1.136. The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 4/30/09



Phillip E. Miller, Esq.

Registration No. 46,060

McGinn IP Law Group, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254

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CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the foregoing was filed by facsimile with the United States Patent and Trademark Office, Examiner Robert W. Hodge, Group Art Unit # 1795 at fax number (571) 273-8300 this 30th day of April, 2009.



Phillip E. Miller
Reg. No. 46,060